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TECHNOLOGY DEPT.

SCIENCE NEWS LETTER

THE WEEKLY SUMMARY OF CURRENT SCIENCE • NOVEMBER 18, 1944

Hybrid Baby

See Page 329

A SCIENCE SERVICE PUBLICATION

If You're Waiting for a Home Telephone

IF YOU are waiting for a home telephone, we think we know how you feel.

You'd like a telephone now—not weeks or months from now. And we'd like to install it for you now.

But due to the war we are short of switchboards and telephones, so there will be unavoidable delays in filling orders for home telephones.

The delay will be as short as we can make it. Meantime, we are genuinely grateful for your patience and co-operation.

BELL TELEPHONE SYSTEM

PHYSICS-CHEMISTRY

Latest Nobel Awards

Dr. Isidor Rabi received the 1944 physics award, and Dr. Otto Stern was awarded the 1943 prize for their atomic research; Prof. Georg von Hevesy Chemistry Nobelist.

➤ DISCOVERING secrets of the atom's heart has won Nobel prizes for two physicists in America. Dr. Isidor I. Rabi, of Columbia University, received the 1944 Nobel award in physics for discovering radiations, emitted by atoms, that have lower pitch than any hitherto observed and devising his magnetic resonance method for measuring them. The 1943 prize in physics was given to Dr. Otto Stern, of Carnegie Institute of Technology, for investigating the structure of the atom by means of the "molecular beam" method.

Dr. Rabi found that atoms act like little radio transmitters broadcasting on ultra-short waves. Their radiations are pitched lower than any previously recorded, but he was successful in devising a method of measuring them.

Dr. Rabi's work opened a way of measuring such subtle properties of atoms and molecules as the magnetism of their component parts, a hundred times more accurately than was possible by any available instrument. Of special significance is his conclusion that "there are no forces between the nucleus and the electrons because of their spins, other than those arising from the fact that the nucleus as well as the electron, is a magnet."

Huge batteries salvaged from obsolete Navy submarines were used by Dr. Rabi and his associates at Columbia University in scientific experiments testing theories concerning the "spin" of electrons in the atom.

Dr. Stern investigated the structure of the atom by means of the "molecular beam" method which he and his collaborators at the Universities of Frankfort and Hamburg developed. Leaving Germany because of Nazi oppression, he continued his research at the Carnegie Institute of Technology where a $25,000 grant from the Buhl Foundation in 1934 established a laboratory for him.

In the molecular beam method of physical experimentation, a gas from the element under study is passed through a fine hole into a chamber where a high vacuum is constantly maintained. Due to the high vacuum, no collisions between the molecules occur and each molecule travels in a straight line. By a series of fine slits the direction of the molecules is controlled and a fine beam is cut out. This is the "molecular beam."

By directing the beam through the region of a magnetic field some of the atoms are deflected from the straight course, and a measurement of the deflection has enabled the physicist to calculate the magnetic moment of the atom—the magnetic force required to deflect them from a straight path.

By applying these studies and also those they have made in wave properties of matter, Prof. Stern and his collaborators have discovered many facts about the structure of the atom.

A desire to engage in intensive studies relative to the use of X-rays on cancer, using the award coming to him as a Nobel prize winner, was expressed, it is reported, by Prof. Georg von Hevesy upon the receipt of the notification. This 59-year-old professor of the Danish Institute of Theoretical Physics, Copenhagen, since 1943 a war refugee living near Stockholm, received the 1943 chemistry award for his work in the use of isotopes as indicators in studying chemical properties.

Among notable studies of Prof. Hevesy was one relative to how the muscle substance, known as creatine phosphoric acid, breaks down during muscular exercises, and how it is rebuilt or rejuvenated in the resting muscle. In this study he used atoms of sodium phosphate labelled by making them artificially radioactive so that no matter where they might be their presence would be detected by the radiations they produced.

Some of the labelled sodium phosphate was injected in frogs, and then, at various time intervals, creatine phosphoric acid was extracted from the muscle. The replacement of the phosphorus atoms could thus be traced.

Heavy water was found by scientists to slow down the life processes in mice and other animals and was thought dangerous for human beings. However, Prof. Hevesy, while a professor at Freiburg, Germany, took very small quantities, not to test the possible poisonousness, but to use the double-weight hydrogen atoms as tracers in order to discover how long water remains in the human body. The water he drank contained 0.46% of heavy water. No harmful effects were reported.

The 1944 chemical prize will probably not be awarded until next year.

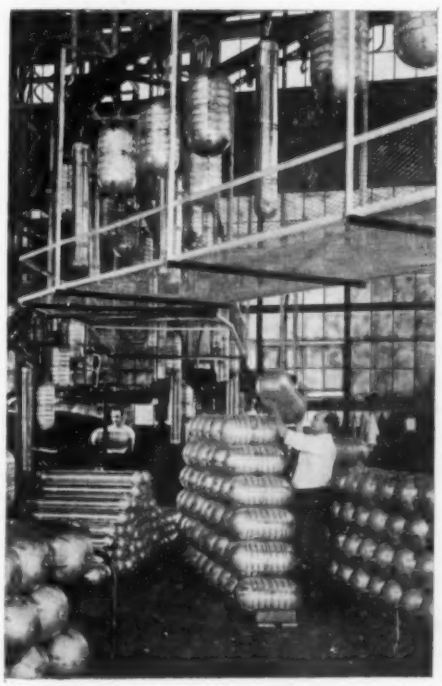
Science News Letter, November 18, 1944

CHEMISTRY

Sodium Bentonite Used for Clearing Turbid Water

➤ A SCIENTIST on the faculty of the State University of Iowa, Prof. Hubert L. Olin, has taken out patent 2,362,022 on a new process for clearing water of the silt that makes it turbid. He uses sodium bentonite, an exceedingly fine-particled clay that has the property of swelling immensely when wet, and in that state captures the small particles of silica that constitute silt. The treatment has proved effective with bentonite additions on the order of 17 to 75 parts per million of water, sometimes used in combination with alum and lime.

Science News Letter, November 18, 1944



WILL NOT EXPLODE — These stainless steel oxygen cylinders will not explode even when pierced by a 20-millimeter shell. The man in the foreground in this Firestone Steel Products Company assembly room, is stacking the type of cylinder used on the B-29 Superfortress.

ENGINEERING

Newspapers by Radio

If new transmitting and receiving equipment now being offered to publishers comes into widespread use, newspapers may be printed in your own home.

➤ NEWSPAPERS printed in your own home may be a reality in the postwar world if new transmitting and receiving equipment now being offered to newspaper publishers comes into widespread usage. Known for many years to engineers as facsimile, the system transmits eight full pages of tabloid-size newspapers in one hour by radio from the newspaper office to receivers in the home.

Before the war, facsimile receivers cost about $75. Research, engineering and manufacturing studies made during the war should make it possible to offer these receivers, with wartime improvements, at an even lower cost.

At the newspaper office, news, maps, cartoons, advertisements, feature columns and other items that make up a newspaper are mounted on a sheet of paper, so that the end result looks the same as a page from a regular newspaper. This sheet of paper is fed into a machine, where it is scanned, line by line, by a photo-electric eye.

The scanning process does the same thing mechanically that you are doing right now as you read this story. It starts at one line, moving from left to right, then jumps to the next line and repeats the procedure, continuing until all the copy has been scanned.

Everything that the photo-eye sees is converted into electric impulses, then into radio waves by electronic tubes similar to those in a radio set. These tubes break up the picture seen by the electric eye into a series of dots, which are received in your home receiver approximately facsimile in size and at the same speed at which they are transmitted.

The printing is done by a swinging arm that moves back and forth across a roll of special white printing paper in the facsimile receiver, synchronized with the movement of the electric eye in the transmitter. A stylus at the tip of the moving arm sweeps across the paper, and by means of small electrical impulses oxidizes a series of dots in their proper sequence, just as the electric eye transmits them. The coating on the paper turns black on being oxidized, leaving a permanent record of the copy fed into the transmitter at the newspaper office.

The receiver can be turned on at a predetermined time, and after the printing is completed, it will go off, leaving the completed newspaper. All this can be done in the early morning hours while the subscriber sleeps, leaving the morning paper ready to be read at breakfast.

Several industrial companies are now actively engaged in postwar planning for facsimile. One of these concerns, Finch Telecommunications, of Passaic, N. J., has just secured the services of a consultant to advise newspaper publishers interested in the development of facsimile as a part of their activities.

In addition to daily newspapers, weather maps, flash news, pictures, police reports showing descriptions and pictures of criminals, reports to and from planes in the air, data for ships at sea and many other types of material may be transmitted and received by facsimile equipment. Facsimile makes use of the same radio frequencies as FM (frequency modulation) broadcasting. This means that the area over which transmission is practical is more or less confined to the area visible from a transmitter antenna. Therefore, unless networks for facsimile are developed, this service will be limited to local areas.

Science News Letter, November 18, 1944

MEDICINE

Blood Plasma Administered With Compact Apparatus

➤DRAMATIC war-poster pictures of a Medical Corpsman administering blood plasma to a wounded soldier, with the flask hung on the butt of an up-ended rifle, may presently be made obsolete by the invention of a Philadelphia physician, Dr. Alison H. Price, on which U. S. patent 2,362,025 has been issued.

Plasma flasks, in hospitals as well as on the battlefield, are hung above the level of the patient simply to obtain enough pressure, through gravity, to feed the fluid into the vein. Dr. Price substitutes air pressure for gravity.

His apparatus consists essentially of three parts: a lower reservoir containing dried plasma, an upper reservoir filled with sterile distilled water, and a rubber syringe bulb to pump up the pressure. Prior to use, the parts are kept separate, all packed within a telescoping cylindrical case. When ready to use, they are pushed together, connections being established by means of hollow needles that plunge through puncturable membranes. A similar needle at the lower end is inserted into the patient's vein, or, at need, into a bone. The water, flowing through the plasma, dissolves it, and the air pressure carries it on into the vein, the whole apparatus functioning in effect as a big hypodermic needle.

Science News Letter, November 18, 1944

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AERONAUTICS-PHOTOGRAPHY

Camera Aids Air Safety

Provides a scientific method of determining the required runway lengths by recording and analyzing take-off and landing characteristics of planes.

➤ A NEW camera system that provides a scientific method of determining the required runway lengths for the safety of air travelers by recording and analyzing take-off and landing characteristics of airplanes has recently been revealed by the Civil Aeronautics Administration.

The system was developed by a number of companies under the direction of the Technical Development Division of the CAA. The equipment includes two cameras, two wind indicator units, two control units and an analyzing projector. In operation, it measures accurately the distances traveled by an airplane along the flight path during a take-off or landing, and the plane's corresponding height, at exactly uniform time intervals.

Where the path of flight follows the center line of the runway, only one camera is required. It is located 1,500 feet to the side of the runway, and opposite the point where the airplane leaves or touches the ground. As the camera follows the movement of the plane, an electrically-controlled shutter snaps the pictures.

Two cameras are used when conditions prevent a precise location of the camera with respect to the path of flight, as in the case of seaplanes or flying boats. The cameras are located up to 2,000 feet apart, and are controlled electrically, so that pictures are taken by both cameras simultaneously. A special type of drafting device is required to project the line of sight from each camera through the imaginary flight paths to a point of intersection.

Each time the shutter clicks, recording the picture of the airplane, a second lens system makes a picture of a small panel which includes instruments for indicating wind velocity and direction, a stop watch, a device for counting the number of frames exposed, and a card on which special information may be written. The direction of the camera at each interval is recorded by photographing an arc marked off in degrees. Both the airplane and the instrument panel appear in the same picture.

An analyzing projector is used to study the pictures. This projector is equipped with a graduated screen which shows the distance traveled by the airplane, and its height above ground when the picture of the airplane is projected on its screen.

The camera was developed by the Bell & Howell Company; the analyzing projector by the W. and L. E. Gurley Company; and the wind indicating unit by the Electrical Speed Indicator Company.

Science News Letter, November 18, 1944

AERONAUTICS

B-29s Are Put Together Like Jigsaw Puzzle

➤ WATCHING final assembly of America's air challenge to the Japanese prong of the Axis, the B-29 Superfortress, is a lot like looking over the shoulders of a number of jigsaw puzzle specialists and watching them put together 40,450 pieces to form a giant airplane. It is an achievement of American engineering and mass production. Only a few completed sections, such as the outboard wing panels, stabilizers, and rudders, come to the Boeing plant in Wichita, Kans., completed from sub-contractors. Sixty-two per cent of every B-29 is fabricated on the spot, on big stationary jigs.

Raw materials flow in a ceaseless stream into the fabrication shops at one end of the big airplane plant. Here parts are stamped out, and moved rapidly on to waiting crews of workers who begin the job of assembling the main sections, the inboard wings, nose, bomb bay, and tail sections. Many of these sections are built standing on end, since it was found that this procedure simplifies the fabrication job. First the framework of ribs is constructed and joined to the bulkheads, and finally the skin is added.

Before the body sections, mounted on wheeled dollies, are moved in on long rows of completed units that lead to the final assembly line, other special equipment is added. This includes instruments, 149 electric motors that control almost every operation performed on the ship, more than ten miles of electric wiring, and a mile and a half of tubing.

When the wings, attached to the bomb bay, known as the inboard wing section, reach the (*Turn to page 327*)

***ASSEMBLY OF THE B-29**—This "exploded" view of the B-29 Superfortress shows graphically the system of production in which major units of the giant airplane are brought together in the final assembly stages. This makes final assemblage a matter of joining and connecting. Visible in the fuselage section at center of main wings is part of the tunnel used by crew members in passing over bomb bays between fore and aft pressurized cabins of the airplane.*

OPTICS

Electronic "Brain"

A new computing gunsight increases the effective range of the Air Forces machine guns, giving them an accuracy approaching that of stationary guns.

➤ A NEW electronic computing gunsight that increases the effective range of the Army Air Forces' .50-caliber machine guns, making it possible for gunners to shoot down the fastest enemy planes with an accuracy approaching that of stationary guns firing at stationary targets, was revealed by Erwin Hale, engineer in charge of airborne fire control instruments of the Fairchild Camera and Instrument Corporation, New York, at the meeting of the Institute of the Aeronautical Sciences, held in Dayton.

The newest of the "electronic brains", designated by the Army as the "K-8" gunsight, was invented jointly by Mr. Hale and Irving Doyle, another Fairchild engineer. It extends the effective range of .50-caliber machine guns mounted on aircraft to more than 1,000 yards. As much as 50% to 90% as many hits have been obtained with the K-8 as when firing at a stationary target from a stationary platform, Mr. Hale reported.

"When it is realized that a pursuit ship must come within 200 to 400 yards of a bomber in order to score effective hits, it is readily apparent that the K-8 provides a really deadly defense against pursuit attack," Mr. Hale remarked.

Installed in aircraft gun turrets, the K-8's provide the correct deflection between the line of sight and the guns to insure hits on enemy aircraft. It is only necessary for the gunner to keep the ring of light in the sight lined up with the target to set up the correct deflection of the gun to compensate for all factors which affect the course of the bullet in flight and to provide the necessary lead to compensate for the enemy aircraft's relative velocity.

All computations are made electrically, and the final voltage representing the desired offset between the line of sight and the gun is then sent to an electronic servo system, which adjusts the guns to the desired offset.

In referring to the differences between the Fairchild sight and the similar type of gunsight developed by the British and now in production in this country, Mr. Hale stated that because development of the British sight began at a later date than the Fairchild sight it "does not provide as complete a solution to the problem."

Electronic gunsights cost less to manufacture than mechanical gunsights, Mr. Hale pointed out, since many parts of the electrical computer are standard radio equipment and a large part of the assembly work consists of wiring up the various units in proper combination, requiring less skilled help than is needed for mechanical sights.

Another advantage of the electronic gunsight is that computations are made instantaneously, a matter of great importance when the gunner is dealing with enemy aircraft moving at speeds of 300 to 400 miles an hour, and bullet velocities of 2,700 feet a second.

Predicting a postwar use for electronic gunsights, Mr. Hale pointed out that they are adaptable for solving complex mathematical problems involving several variables which are difficult or impossible to handle by mechanical means. These gunsights can be adapted to obtain accurate solutions to such problems without time lag and with a minimum of equipment and expense.

Science News Letter, November 18, 1944

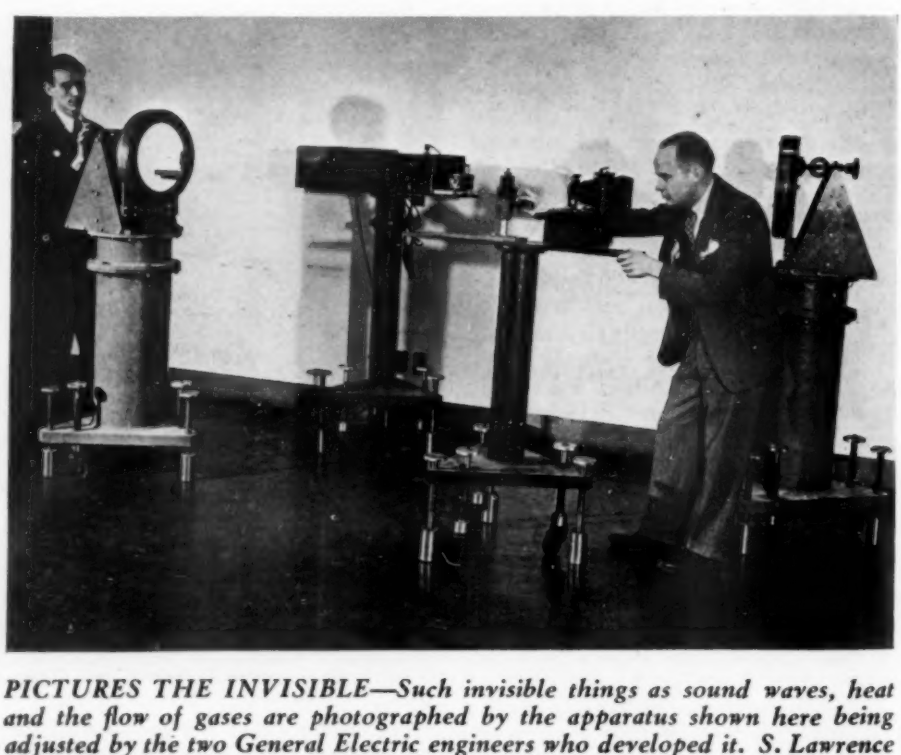
ORDNANCE

New Explosive Bullet Is Subject of Invention

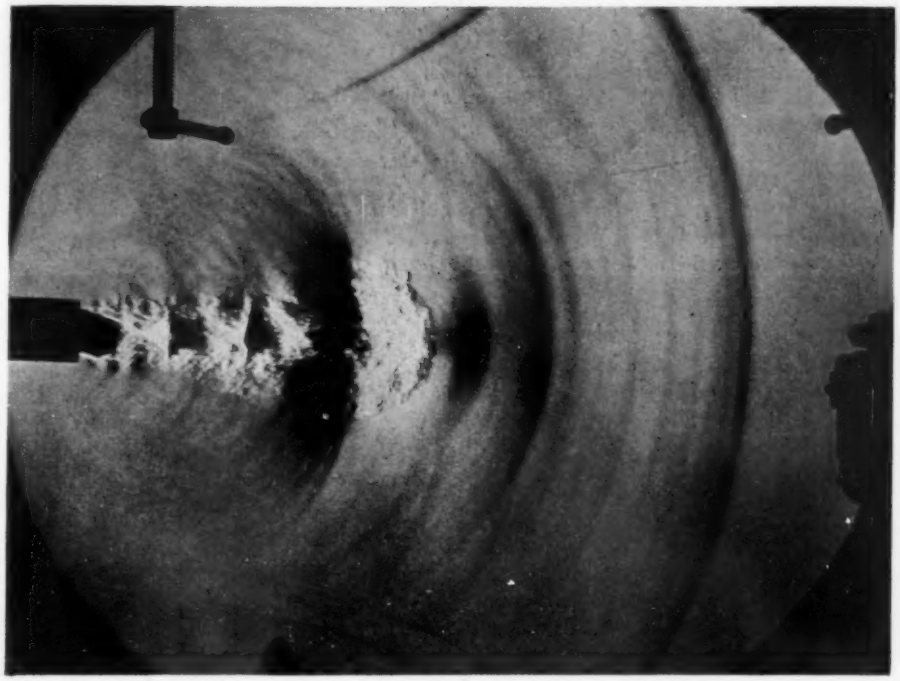
➤ A NEW type of explosive or incendiary bullet is the joint invention of an officer and a civilian, Col. W. T. Moore, U. S. Army, and Richard N. Nelson of Black River Falls, Wis., employed in the Ordnance Division. The core of a jacketed bullet is made hollow, to receive the explosive charge. Between the core and the nose of the jacket is a small hollow space, through which a small metal capsule containing a detonating cap can move. When the bullet strikes, this detonator snaps forward, strikes the inside of the jacket, explodes and sets off the main charge.

Rights in the patent, No. 2,361,955, are assigned to the government.

Science News Letter, November 18, 1944



***PICTURES THE INVISIBLE**—Such invisible things as sound waves, heat and the flow of gases are photographed by the apparatus shown here being adjusted by the two General Electric engineers who developed it. S. Lawrence Bellinger (left), focuses one of two telescope-type, extremely precise mirrors used, while Norman F. Barnes synchronizes the knife-edge assembly which cuts off from the camera all light except that affected by heat and pressure. The process, called the Schlieren photographic process, was used in taking the picture on the opposite page.*



BLAST—This is what happens to the air surrounding the muzzle of a gun when it is fired. Coming from the muzzle, shown at left center, are gases that are expelled. Long, dark, curved line shown at the right is the high pressure, or sound, wave. This is produced when the compressed gas in the barrel first begins to expand from the muzzle. The short, black, curved line at the top of the picture is a reflection of the sound wave from a metal plate. This picture was taken in only four-millionths of a second, by the Schlieren process.

PSYCHOLOGY

Morale Builders

➤ SOLDIER morale depends on two things: faith in his leaders and faith that the folks back home are backing him up, not only by buying war bonds but in their attitude and daily behavior, Dr. Edward A. Strecker of Philadelphia, consultant in psychiatry to the surgeons general of both Army and Navy, declared at the meeting of the Chicago Institute of Medicine.

"An army may march to its objective on its belly," he said, "but it takes its objective by its morale."

His contact with soldiers in and from various combat areas leads him to believe that almost irrespective of educational and cultural levels and before giving consideration to questions such as why we are fighting this war, we must satisfy the soldier's urgent need for faith in his leaders and in support from the home front.

"The morale barometer of troops in the field," he said on this last point, "dropped appreciably at the news of the coal and other strikes."

A skeleton neuropsychiatric organization capable of expansion in case of need should be kept in the Army after the war, no matter how small the peacetime Army may be, he said.

The surgeon general should be a member of the General Staff, he urged.

"It is incomprehensible," he declared, "that the surgeon general, who presides over the medical health and care of more than 8,000,000 men, should be under the line, which, if it chooses, may override his judgment in medical matters."

Turning to the future, he declared that the neuropsychiatric experience of this war teaches that we "must learn at once a sounder evaluation of democratic civilization and put it into practice before it is too late."

Although the considerable segment of young men discharged from the Army after a short trial of service and the larger segment rejected at induction are best described as temperamentally unsuited for military life, the records show, Dr. Strecker stated, that the majority had not adjusted satisfactorily in civilian life.

"One makes no progress at all," he said, "by precipitating arguments as to whether these men are really sick. Of course they are sick, even if there should happen to be a considerable element of malingering in the situation.

"Much more important is it to know what the sickness expresses, its significance for democracy and, if possible, its origin."

Most of these men, he said, are not only unable but unwilling to serve. They show "a profound disturbance of the 'I and You' relationship."

Explaining, he pictured each individual as the center of a series of concentric circles representing his inalienable rights, which eventually expand to a point where they begin to impinge on the circles surrounding other individuals.

"The intermediate mutually held territory between I and You should be and in fact must be a land of fair give and take, of reasonable concession and of decent tolerance. While this area must necessarily have shifting boundaries, yet it is so significant that I do not think it is too much to say that the survival or the death of democracy will depend on a clearer understanding and a more accurate delineation of the I and You relationships enclosed in the area."

Science News Letter, November 18, 1944

From Page 325

final assembly line, they already carry gas tanks, two-and-a-half-ton main landing gear, and four giant nacelles.

Four assembly lines that move regularly send completed planes out the front door to be tested and flown. On each of these assembly lines a pair of ten-ton overhead cranes carries the 17-ton inboard wing section, all in one piece, and lowers it into place in a slot between the double bomb bay and nose section, with only quarter-inch tolerance. Finally the tail assembly is fitted on and pushed by the same workers who complete the final assembly. The completed B-29, weighing 120,000 pounds, is rolled out through the giant doors of the plant toward its first takeoff on the road to Tokio.

There are more women than men employees at the Boeing-Wichita plant where the bulk of the B-29s are being fabricated. Most of the more than a million rivets that go into each plane are driven by women. Many were nurses, schoolteachers, students or housewives.

Science News Letter, November 18, 1944

MEDICINE

Mice Travel 5000 Miles To Aid Cancer Research

➤ A NEW long-distance travel record has been set by a dozen mice which went by air over a secret route from London to somewhere in Russia carrying in their bodies three kinds of tumors for cancer research.

The distance covered, probably five or six thousand miles, is believed the longest journey yet accomplished by mice for the purposes of research. It is reported by Dr. E. L. Kennaway, of the Royal Cancer Hospital (Free) and Dr. W. E. Gye and Dr. J. A. Marsh, of the Imperial Cancer Research Fund, in the scientific journal (*Nature*, Oct. 14).

The mice were sent at the request of Prof. S. A. Sarkisov of the Institute of the Brain, Moscow, to Prof. L. Shabad, formerly director of the Laboratory of Cancer Research in the Institute of Experimental Medicine, Leningrad.

For their air journey, each batch of four mice was placed in a wooden box with hay and sawdust as bedding and enough oats, puppy biscuits and proprietary rat food to last many weeks. Water was supplied from bulbs used for laboratory animals. A syringe for filling these and directions to be translated into Russian were supplied.

Prof. Shabad reported all 12 mice arrived safely within about three weeks and that the three kinds of tumors they bore have been successfully grafted in the mice available in his laboratory.

"Before the war," the English scientists point out, "many such mice crossed the Atlantic on liners, chiefly from west to east, in charge of the butcher, who at sea is the custodian of animals living and dead, but this is a shorter journey without halts and changes and the conditions of temperature are uniform."

Science News Letter, November 18, 1944

ORNITHOLOGY

General's Birds Come to National Zoological Park

➤ FIVE BIRDS, that until now have been pets of an American general in the Solomon islands, have been added to the National Zoological Park collections in Washington. They were sent by their former owner, Maj. Gen. R. G. Breene, U.S.A., when new duties prevented him from keeping them any longer.

Dr. William M. Mann, director of the National Zoological Park, states that all birds represent species hitherto unknown in the cages here. They comprise one pair of bare-eyed cockatoos and one specimen each of thick-billed green parrot, rosy lory and gallinule.

Although the birds arrived in apparent good health and have all passed the customary quarantine at the port of entry, they are being kept segregated from the other birds until absence of any infectious disease is completely assured.

Science News Letter, November 18, 1944

CHEMISTRY

Life of Shoe Sole Leather Increased by Oil Formula

➤ SHOE SOLE leather for soldiers and civilians, treated with oil preparations to increase their wearing qualities, owe much of their improvement to a special oil formula developed at the laboratory of the Tanners' Council of America at the University of Cincinnati, and withheld from the public until now. Dr. Fred O'Flaherty, director of the laboratory, the only one of its kind in the United States, announced the formula.

The sole leather, he states, "should be immersed for 30 minutes in a solution of not less than 60% by weight of nonvolatile base, preferably solvent naphtha, not less than 25% by weight of a fatty oil with a viscosity of at least 2,500 Staybolt units at 100 degrees Fahrenheit, the balance of the oil base consisting of a mineral oil, preferably naphthenic-base oils, of such a viscosity that the overall viscosity of the oil base, without solvent, exceeds 1,800 Staybolt units at 100 degrees Fahrenheit."

This oil treatment, Dr. O'Flaherty says, increases the wearability of shoe soles by 25% on an average.

The treatment of sole leather with oils, and with wax, is not altogether a new practice but the wartime scarcity of leather has caused its more extensive use and much interest has centered on a more satisfactory preparation than those formerly used.

During 1943 the National Bureau of Standards conducted extensive research on the improved wearing qualities of treated soles, examining some 30 commercial mixtures for waterproofing and improving the wear. The Bureau found the life of soles with preparations tested was increased from 14% to 40%, the higher percentages being with wax-impregnated leather. A Washington high school military unit was used by the Bureau in conducting its service tests.

Science News Letter, November 18, 1944

IN SCIEN

EARTH-SCIENCE

Giantess Geyser Erupts For First Time Since 1942

➤ THE GIANTESS geyser, in the Old Faithful area of Yellowstone National Park, recently erupted for the first time since June 1942. Noises during the night, resembling subterranean cannonading, were recognized by District Park Ranger Bauman as symptoms of one of the Giantess' tantrums.

In the morning the geyser was found steaming heavily, with little water in its crater but showing signs of having overflowed during the night, the water damaging the rim somewhat and washing away most of the minute plants called algae which give geyser craters and hot springs formations their coloring. On the west side of the crater the deposit known as sinter had been washed away and spread out in fragments or layers like an alluvial fan.

Shortly the geyser again erupted, shooting up rockets of water to a height of from 80 to 100 feet; and geysering continued at about 20-minute intervals until well into the afternoon. Shortly after noon jets of water reached a height of at least 150 feet.

The Giantess is one of the most powerful of the park's geysers, its eruptions lasting from 12 to 36 hours. Once it erupted every 10 or 20 days, but now eruptions occur at much longer intervals. Again asleep, it is difficult to foretell when the Giantess will next go into action.

Science News Letter, November 18, 1944

INVENTION

Tractor Power and Cable Pull Trees Up by Roots

➤ A REVOLUTIONARY invention for use in lumbering and land clearing, with a touch of Paul Bunyan about it, is covered by patent 2,361,931, granted to Alfred W. Evans of Gloucester, Va. Instead of first felling the trees and then pulling or blasting out the stumps, he uses tractor power applied to a winch-wound cable to pull the whole trees out by the roots, using a twisting drag. One end of the cable has to be anchored to a giant tree, the other to the smaller tree that is to be the victim.

Science News Letter, November 18, 1944

NE FIELDS

MEDICINE

Chilling and Baking Soda Tried as Penicillin Aids

➤ TWO WAYS of increasing the efficiency of penicillin treatment are reported, (*Science,* Nov. 10).

Strapping an ice bag over the site of injection of the drug saves 50% of the amount of penicillin required for each patient, Lt. Comdr. Max Trumper and Lt. Comdr. A. M. Hutter, of the National Naval Medical Center, Bethesda, Md., find. The reason is that the chilling slows blood circulation and therefore the rate at which penicillin is carried to the kidneys and excreted from the body.

Excretion of penicillin taken by mouth can be slowed by giving it with sodium bicarbonate, Drs. Alfred H. Free, Jack R. Leonards, D. Roy McCullagh and Barbara E. Biro, of Western Reserve School of Medicine, found. Although in most cases it would be more convenient for both patient and physician to have the drug given by mouth instead of by hypodermic injection, this method has not been used much because of the limited supplies of penicillin and the fact that it was difficult when giving it by mouth to have a high enough level in the blood to be effective.

Science News Letter, November 18, 1944

MEDICINE

Lactose Used for Penicillin-Producing Mold

➤ LACTOSE, or milk sugar, is used in giving the penicillin-producing mold a well-balanced diet. Although the mold grows luxuriantly on almost any nutrient solution, it will not make penicillin unless conditions in its diet and environment are carefully controlled. Thus corn steep liquor, lactose and some essential salts and water are used in producing the germ-killing mold.

A certain amount of sugar is also considered necessary to the diet of human beings. People as a whole are most familiar with sucrose, the cane or beet sugar used to sweeten desserts, pastries and drinks at home, but sugars from many other sources are also in constant use. Some are used as substitutes for sucrose, others are employed in preference to sucrose because of their special qualities.

Dextrose, which is generally made from corn, is from two-thirds to three-fourths as sweet as the sugar made from cane or beets. Lactose, derived from cow's milk, is only about a quarter as sweet. All three of these, and a number of sugars made from other sources, are carbohydrates, being compounds of carbon, hydrogen and oxygen. Characterized by water-solubility, crystalline form and absence of color, they are best known for their sweet taste.

Saccharin, which has no food value, is from 450 to 500 times as sweet as sucrose. Doctors sometimes prescribe its use by those suffering from diabetes.

If you would like to have samples of sucrose, dextrose, lactose and saccharin, you can secure the Sweetness Unit of THINGS of Science, a kit prepared by Science Service, by sending 50 cents to SCIENCE NEWS LETTER, 1719 N Street, N. W., Washington 6, D. C. and asking for Things unit No. 48.

Science News Letter, November 18, 1944

OPTICS

Diffraction Gratings Better Than Originals

➤ COPIES of diffraction gratings, glass or metal with closely spaced parallel lines ruled on it, used in many types of spectrographs, are even better than the original gratings from which they were made, Dr. R. W. Wood, the Johns Hopkins University physicist, has reported (*Journal of the Optical Society of America,* Sept).

Coarse gratings of 1,000 to 7,000 lines to the inch, which are especially useful for analyzing infra-red light, are first ruled on copper plates which have been polished as well as possible but cannot be made as flat as polished glass.

The collodion cast or copy of the original grating will reproduce faithfully both the carefully ruled lines and the small irregularities of the surface of the copper plate. But when this replica is pressed into contact with a piece of optically flat plate glass, the imperfections on the surface are "ironed out," leaving the replica with better optical properties than the original.

Studies of light spectra with these gratings not only extend our knowledge of the behavior of atoms but also have practical applications such as the identification of impurities in chemicals or metals. Spectrographic analysis is one of the most powerful tools of modern physics.

Science News Letter, November 18, 1944

CHEMISTRY

New Kind of Coating Protects Structural Steel

➤ ZINC CHROMATE and iron oxide-zinc chromate primings to protect iron and steel from corrosion, when properly formulated with a synthetic resin vehicle, make a very good rust-inhibitive coating, the National Bureau of Standards states in a new report on paints for structural steel.

They combine to a high degree the essential requirements necessary to withstand extremely severe corrosive atmospheres, the Bureau finds from extensive tests. Zinc-dust paints, particularly the alkyd type, have good adhesion on galvanized iron. Among the top-coat finishes tested, aluminum, black and dark-colored paints were found the most durable.

This report is the third and final summary of the Bureau's investigations of surface treatments for protecting steel against corrosion, with special reference to low-cost housing construction. Both outdoor and accelerated laboratory tests were used, and the primings were applied to treated and untreated steel and to galvanized iron panels.

Many paints were found suitable for use in protecting metal structures. Their composition and relative ratings, based on their performance in the tests, are discussed in the report, copies of which are now available from the Superintendent of Public Documents.

Science News Letter, November 18, 1944

ZOOLOGY

Hybrid Gibbon Baby And Mother Play at Zoo

See Front Cover

➤ THE first hybrid gibbon ever born is now a little over six weeks old (*See SNL,* Oct. 14). The baby and his mother seen in the photograph taken by Fremont Davis, Science Service staff photographer, on the front cover of this SCIENCE NEWS LETTER, attract a good share of attention at the National Zoological Park in Washington The mother and father, two of the zoo's best acrobats, go through a routine each day, the baby always clinging to his mother.

This hybrid between a Siamese gibbon and a Sumatran gibbon is not very distant and could probably occur in nature; but there has never been any such cross reported.

Science News Letter, November 18, 1944

AGRICULTURE

Turkey for Thanksgiving

Five hundred million pounds of turkey is marching on 70 million sturdy drumsticks towards the ovens, with large birds for hotels and small ones for families.

By FRANK THONE

▶ FIVE HUNDRED million pounds of turkey is marching on 70 million sturdy drumsticks towards the Thanksgiving ovens. It is the grandest army of our real national bird that has ever laid down its collective life for our country, with the sole exception of the Great Gobbler Year of 1940.

If you count out vegetarians and infants without teeth, that tonnage of turkey-meat divides up at a per capita rate of about four pounds for each inhabitant of these fortunate United States. In case you don't find that much draped over the dressing on your civilian plate, remember that the boys and girls in the Armed Services will be eating at first table and accept your slightly diminished portion in a spirit proper to the day.

Elaborate preparations have been made to see to it that a turkey dinner is served to everyone in the Services, even to men under fire in front-area foxholes. They may have to eat with a drumstick in one hand and a grenade in the other—but they'll get their turkey. Unsung, undecorated QM heroes will see to that.

Recruiting Turkeys

Recruiting this huge horde of turkeys for our national feast-day has been more than just a job for butchers, refrigeration men and transport workers. Before they ever got to work, indeed before the beginning of the war itself, scientists in the U. S. Department of Agriculture and in several state experiment stations were at work on the Thanksgiving bird, remolding it for greater efficiency as a source of good eating.

This reconstruction of the turkey has taken two opposite directions. For one purpose, we wanted ever bigger and bulkier birds; for another, the breeders' blueprints called for smaller, more streamlined dimensions.

For the purpose of providing Thanksgiving dinners in batches of hundreds or thousands, the big turkeys of our grandparents' farmyards needed to be made even bigger. And since white meat is always the preferred portion (even when you're too polite to say outright that you want it), the breeders not only selected their stocks for greater all-over bulk but had an especial eye out for as much weight forward of amidships as possible.

Their efforts, over a decade or so, have produced a strain labeled with the alliterative title of Broad-Breasted Bronze. With plumage of all autumnal hues condensed, the real glory of this bird is hidden under its breast-feathers, where an actual increase of 20 per cent in white meat has been brought about.

Ready for War

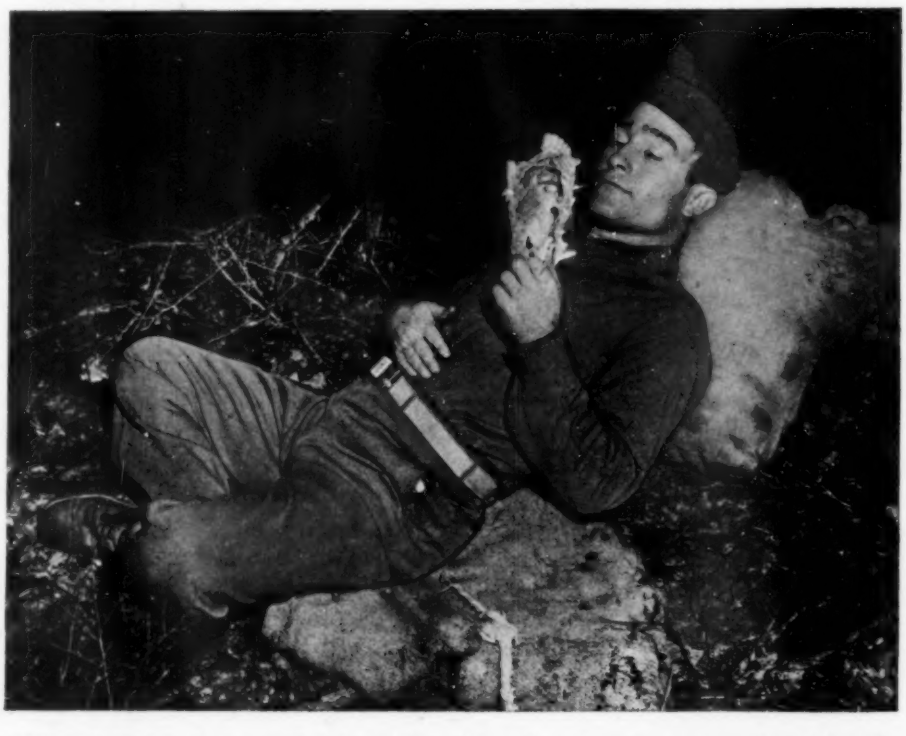
Designed for peacetime purposes such as the hotel and restaurant trade and the provisioning of hospitals, college dining halls and other similar large-scale institutions, these super-turkeys were all set for war, too, and ready to cope with the hearty appetites of hard-working, hard-fighting men in uniform—not to forget the WACS, WAVES and the other girls in uniform, who aren't exactly peckish about their eating, either, nowadays.

While the turkey breeders were working up these bigger and breastier bronze birds for the large-scale dining-room business, they were putting the brakes on size for the individual-family fowl. Families aren't as big as they were a couple of generations ago, neither do all the children and grandchildren foregather at the Old Folks' farm on Thanksgiving Day. Therefore a smaller turkey was in order.

Streamlined Bird

Product of the scientists' efforts, so far, has been a somewhat streamlined bird, the young hens having a dressed weight of around seven or eight pounds, the young toms tipping the scales at 12 or 14. Though the new turkey is small it is not thin; there is plenty of white meat, and the flesh is of superior quality. This is the kind of turkey you are likely to get for the home table, now that the Boy (and maybe the Girl, too) is off attending a war.

Scientists haven't (*Turn to page 332*)



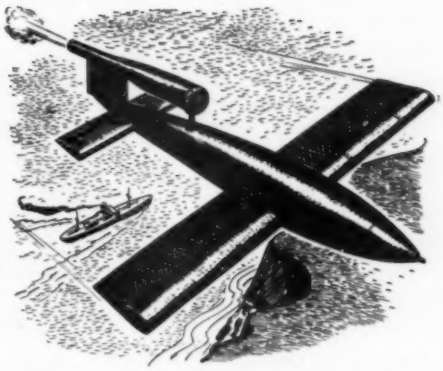
NOT BAD!—A successful job of packing has just been completed by the soldier seen in this official Signal Corps photograph. Table linen and silverware may have been lacking, but the turkey was there all right!

General Electric answers your questions about

JET PROPULSION

Q: Is it like a rocket?

A: No. A rocket carries fuel and oxygen to burn it. A jet-propelled plane carries fuel for its G-E engine, but takes oxygen from the air. A rocket might travel to the moon, but a jet-propelled plane could never go beyond the earth's atmosphere.



Q: Is it like the German robot bomb?

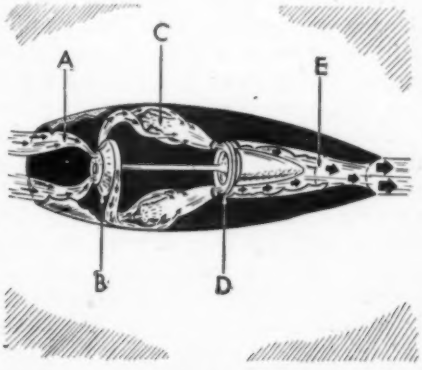
A: A little. The robot bomb uses a crude form of jet propulsion, but it hardly compares with a power plant that can drive a combat plane. The G-E jet propulsion engine powers fast, high flying fighter planes. They are easy to handle.

Q: What was G. E.'s part?

A: G-E engineers developed the jet propulsion engine from a design by Group Captain Frank Whittle of the R. A. F. G. E. was chosen by the Army Air Forces because of G.E.'s experience with turbines and turbosuperchargers.

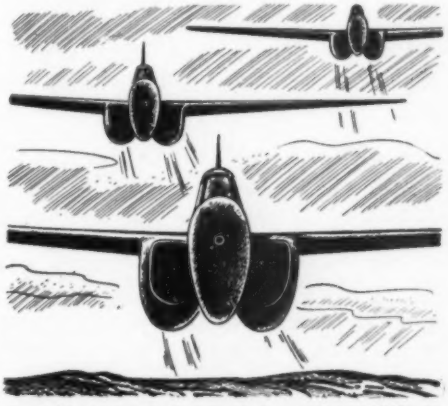
Q: What makes the jet plane go?

A: The same kind of force that makes a toy balloon scurry when it slips from your fingers. Or that makes a gun kick against your shoulder. Or that makes a rotary lawn sprinkler turn. You see forms of jet propulsion every day.



Q: How does the engine work?

A: Air flows from "A" through compressor "B" into chamber "C," where it is heated and expanded by burning fuel. This hot gas turns turbine "D," which operates compressor "B." Gas rushing through nozzle "E" propels the plane.



Q: What does the jet plane look like?

A: It looks much like any other plane, but propellers are missing and there is no sign of conventional engines. Sketch shows the P-59A, built for the Army Air Forces by Bell Aircraft, and powered by two G-E jet propulsion engines.

The General Electric jet propulsion engine is one of hundreds of products made by G.E. for the aviation industry. It is another example of how G-E science and engineering work to supply America's needs—in war and peace. *General Electric Company, Schenectady, N.Y.*

GENERAL ELECTRIC

952-616-211

Hear the General Electric radio programs: "The G-E All-Girl Orchestra" Sunday 10 p.m. EWT, NBC—"The World Today" news, every weekday 6:45 p.m. EWT, CBS.

FOR VICTORY—BUY AND HOLD WAR BONDS

Do You Know?

Crocodiles may be called present day relatives of the dinosaurs.

Sealed beam *auto headlight* lamps are used as landing lights for warplanes.

About 90% of all *salmon* caught by United States fishermen is taken in Alaska.

Some *desert plants* have a rapid growth to finish their growing cycle before the hot weather begins.

The quick-freezing of winter oysters began shortly before the present war; *frozen oysters* will probably be plentiful again in postwar days.

The electric *refrigerator* should stand three or four inches from the wall behind it and should have a ten-inch space above it to permit circulation of air so that the condenser coils may properly cool.

RESISTANCE BOXES FOR MANY USES

These small, inexpensive Resistance Boxes, shown above in a Kelvin Bridge network, are suitable for commercial-power frequency, a-c as well as d-c. They are made in seven sizes; three 2-dial boxes having total resistance of 99,990 and 9900 ohms resp; two 3-dial boxes of 999 and 9990 ohms resp; two 4-dial boxes of 9999 and 999.9 ohms resp. Prices range from $21.00 to $35.00.

The Standard Resistor used is our Reichsanstalt type, designed for low-resistance measurements and for accurate determinations of current with a potentiometer. They are made in 3 values; 0.1 ohm at $50.00, 0.01 ohm at $55.00 and 0.001 ohm at $120.00.

The Galvanometer employed is our No. 2420 Enclosed Lamp and Scale, popular for measurements of moderately high sensitivity. Its price is $40.00.

All these instruments are described in our Publication "Modern Precision", Vol. 4, No. 1.

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Books of the Week

THE ABC OF PHYSICS—Jerome S. Meyer—*Dial Press, Inc.*, 346 p., illus., $3.50.

AMERICAN PHILOSOPHICAL SOCIETY, PROCEEDINGS, Oct. 18, 1944—*Am. Philosophical Soc.*, 357 p., paper, illus., $1, (Vol. 88, No. 4).

A. S. T. M. STANDARDS ON TEXTILE MATERIALS—A. S. T. M. Committee D-13—*Am. Soc. for Testing Materials*, 473 p., paper, illus., $2.75.

A COURSE IN THE FUNDAMENTALS OF MECHANICS — Morton C. Mott-Smith and Marjorie Van de Water—*Infantry Journal*, 188 p., illus., paper, 25c.

DAMNED TO GLORY—Robert L. Scott, Jr.—*Scribner*, 228 p., $2.50.

DELAWARE'S BURIED PAST, Story of Archaeological Adventure—C. A. Weslager—*Univ. of Pa. Press*, 170 p., illus., $2.50.

INTRODUCTION TO MATHEMATICAL LOGIC, Part I—Alonzo Church—*Princeton Univ. Press*, 118 p., paper, $1.75.

THE LITERARY MARKET PLACE, 1944—*Bowker*, 113 p., paper, $2., 4th ed.

LOOK TO THE FRONTIERS, a Geography for the Peace Table—Roderick Peattie—*Harper*, 246 p., illus., $3.

PLASTIC MOLDING AND PLANT MANAGEMENT—D. A. Dearle—*Chemical Pub.*, 196 p., illus., $3.50.

PRODICAL GENIUS, the Life of Nikola Tesla—John J. O'Neill—*Washburn*, 326 p., illus., $3.75.

RE-EDUCATION IN A NURSERY GROUP, A STUDY IN CLINICAL PSYCHOLOGY—Ruth Wendell Washburn—*Nat. Research Council*, 175 p., paper, illus., $2, (Monographs of the Soc. for Research in Child Development, Vol. IX, No. 2).

THOMAS JEFFERSON AND THE SCIENTIFIC TRENDS OF HIS TIME—Charles A. Browne—*Chronica Botanica*, 423 p., paper, illus., $1.25, (Chronica Botanica, Vol. 8, No. 3).

TRICHINOSIS—Sylvester E. Gould—*C. C. Thomas*, 356 p., illus., $5.

Science News Letter, November 18, 1944

From Page 330

finished the job on either the big or the little new turkey—they can always see room for improvement, anyway. They think there's still a chance to increase the proportion of white meat, and to decrease the time it takes to plump the birds up for market.

From the raiser's point of view, there's the important problem of hatchability of the eggs to consider. Turkey eggs have always had lower fertility and hatchability than those of other domestic fowl; the new strains have been brought to a point where eight out of every ten eggs put in the incubator will produce a turkey chick—a really good score.

Under wartime conditions, feeding the turkeys has presented problems for the poultry nutritionist. Dried skimmilk, once the standard source for high-quality protein feed, has been diverted to direct human use to a tremendous extent. A satisfactory replacement has been found in soybean protein. Vitamins for the enrichment of the young turk's diet have had to be obtained from new sources, too: one has been a by-product of industrial alcohol fermentation, itself vastly increased to supply war industries.

Present fighting in the Danube valley, and the Balkans generally, carries us into another part of the turkey's story—the apparent historical background of its name. For although the turkey is a strictly American bird, its name seems to have become attached to it in this alien quarter of the globe, back in the days when much of the Danubian country and all of the Balkan peninsula were included in the Turkish empire.

Such American products as the turkey, corn, pumpkin and navy beans did not find their way directly from Spain into northwestern Europe, during the early days of discovery and exploration. The Turks got them from the Spaniards and carried them into the rich farm area of the lower Danube. From there they worked their way into the German and Italian lands, (*Turn to page 344*)

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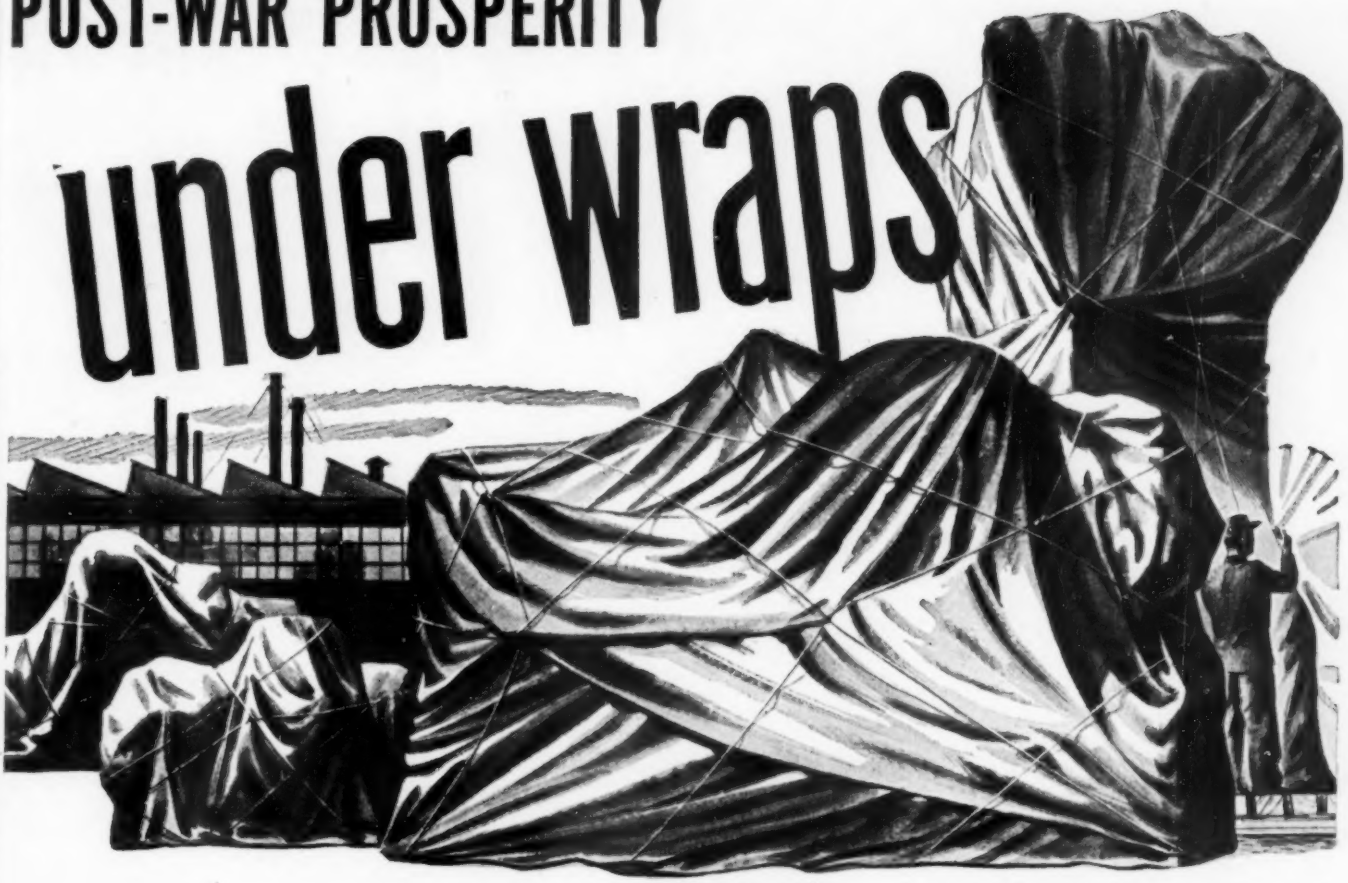
POST-WAR PROSPERITY

under wraps



Machines for making passenger cars were stored away when America went to war. Soon they will produce civilian automobiles and jobs again—and here's why they will be better automobiles than ever before!

▶ Producing 6,000,000 automobiles a year will provide many a postwar job.

The metals, rubber, fabrics, glass, ceramics, plastics, electrical parts and other materials consumed by such production will help to stimulate many industries.

Every car manufacturer will produce to the limit at first—and for some months after "the wraps" are taken off. All cars will be "easy to sell." But after most of the essential replacements are made—what then?

Early in the post-war period, cars will undoubtedly become better looking, more comfortable, easier to handle and drive. But the most significant progress in motorcar design will depend—in the future, as in the past—*upon the development of engines that get more work out of each gallon of gasoline.*

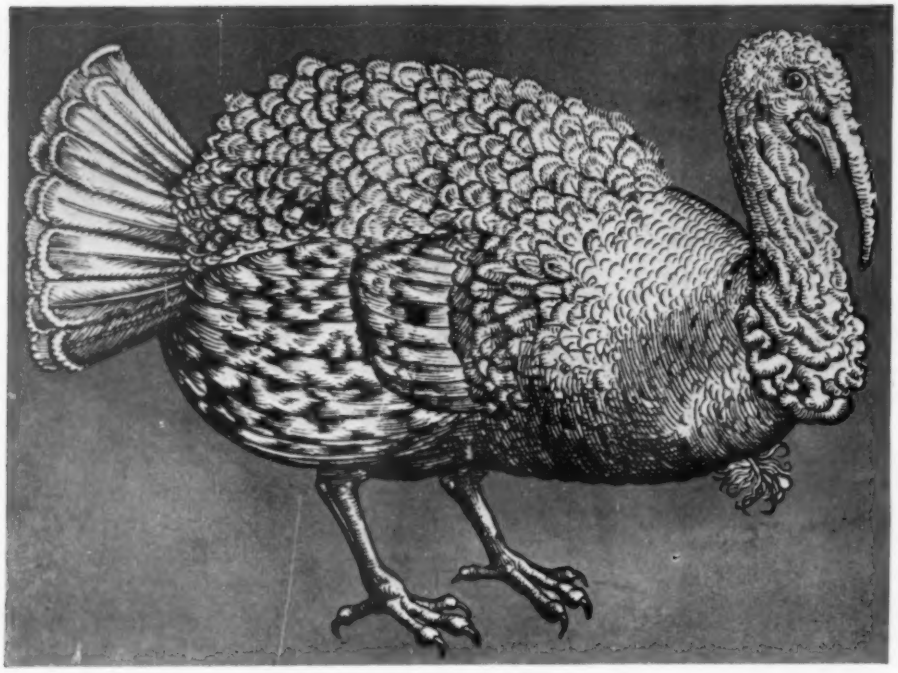
A big step in this direction has already been taken. Immediately after the war the petroleum industry will be able to supply gasoline of far higher quality . . . gasoline that *in engines designed to utilize it* will give more power, more mileage, better performance. Thus, the *foundation* for more efficient engines is already laid.

ETHYL CORPORATION

Chrysler Building, New York City

Manufacturer of Ethyl fluid, used by oil companies to improve the antiknock quality of aviation and motor gasoline.

Wartime progress by America's petroleum industry has paved the way for fundamental progress in post-war automobile engine design.



FIRST TURKEY PICTURE—Believed to be the first picture of a turkey ever printed in a book, this curious illustration from Conrad Gesner's 400-year-old Historia Animalium is "modern" in at least one respect: the abnormally long forward part of the body would bear plenty of white meat.

From Page 332

and so eventually into France, the Low Countries and England.

Many of these American products picked up the misnomer "Turkish" on this roundabout journey. Their true origin remained obscure to western Europeans, who were on hostile terms with the Turks most of the time.

However that may be, within 50 years after Columbus' first voyage, the great German botanist Leonhart Fuchs was publishing a picture and description of the corn plant under the name of Turkish corn, and in the same book he called one kind of pumpkin a Turkish cucumber.

At about the same time, another noted naturalist, the German-Swiss Konrad von Gesner, figured and described the turkey as the "Indian, or Calcutta fowl." Because it had come via the Near East, he assumed it had come from the East Indies, instead of the West Indies.

Although the turkey is still known in various Continental languages by names that perpetuate this error ("dindon" in French, for example) by the time it got to England it was simply the "Turkey bird." And so the name has stuck.

Science News Letter, November 18, 1944

This Palatable Variety . . .

liver, heart, tongue, sandwich meat, bacon, bologna, frankfurters, liver sausage, salami, etc. . . . deserve dietary recognition not only for their high protein content but as good sources of the vitamins as well.* Their palatable taste, their availability, and their relatively reasonable cost merit frequent inclusion in the diet.

*"Canadian bacon, summer sausage, and sandwich meat contain larger amounts of thiamine than fresh beef, veal or lamb but smaller amounts than fresh pork . . . Of the fresh organ meats studied heart was found to be the richest in thiamine . . . Liver and tongue contained about the same amount of thiamine as muscle meat . . . Liver sausage contains nearly 3 or 4 times as much riboflavin as any of the other prepared meats . . . The other prepared meats fall in the same range as fresh muscle meats . . . The nicotinic acid contents of the prepared meats and fresh muscle meat are about the same . . ." (McIntire, J. M.; Schweigert, B. S.; Herbst, E. J., and Elvehjem, C. A.: Vitamin Content of Variety Meats, J. Nutrition 28:35, July 10, 1944.)

ACCEPTED AMERICAN MEDICAL ASSN. Council on Foods

The Seal of Acceptance denotes that the nutritional statements made in this advertisement are acceptable to the Council on Foods and Nutrition of the American Medical Association.

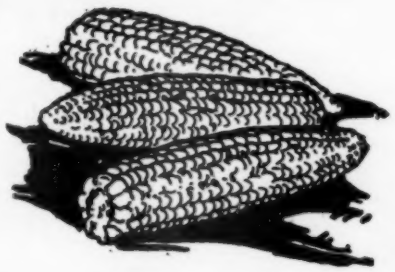
AMERICAN MEAT INSTITUTE

MAIN OFFICE, CHICAGO . . . MEMBERS THROUGHOUT THE UNITED STATES

ANTHROPOLOGY

NATURE RAMBLINGS

by Frank Thone



Prehistoric Extension Work

► CULTIVATION of certain plants by the Indians was remarkably widespread, despite their lack of long-range means of transportation and communication. When the first English settlers came to Virginia and Massachusetts, they found the Indians using corn, pumpkins, squashes, beans and tobacco, none of which was native to the Atlantic seaboard of this continent. Corn and tobacco came from somewhere in South or Middle America, pumpkins and squashes apparently from Mexico, and beans from a region that lies partly in our own Southwest, partly in northern Mexico. Indians who maintained friendly relations with their new neighbors passed on their knowledge of cultivation methods—which was a literal lifesaver for the often hard-pressed whites.

Nobody knows how these plants and the art of cultivating them came into the hands of these Indians, so remote from their original centers of distribution. Neither does anybody know how long a time was required for the spread of this knowledge. It seems reasonable to conjecture, however, that the process was slow, and that the knowledge passed from tribe to friendly tribe, very much as it passed from friendly Indians to the first paleface farmers.

There is at least an outside possibility, however, that new crops and methods may have been speeded up occasionally by what might be termed prehistoric agricultural missionaries. Crop cultivation among Indians, as among many other relatively primitive peoples, had a very large religious content. In Aztec Mexico especially, corn cultivation was also a cult, with a zealous priesthood.

One may at least speculate on the possibility of members of that priesthood (or more likely, an even earlier one) having travelled among neighboring tribes, at least as far as their prestige would accredit them, spreading the gospel of the great Maize God. Then, after the lapse of the missionary effort, their none-too-solid converts may have backslid, forgetting the god but keeping his envoys' gift.

Science News Letter, November 18, 1944

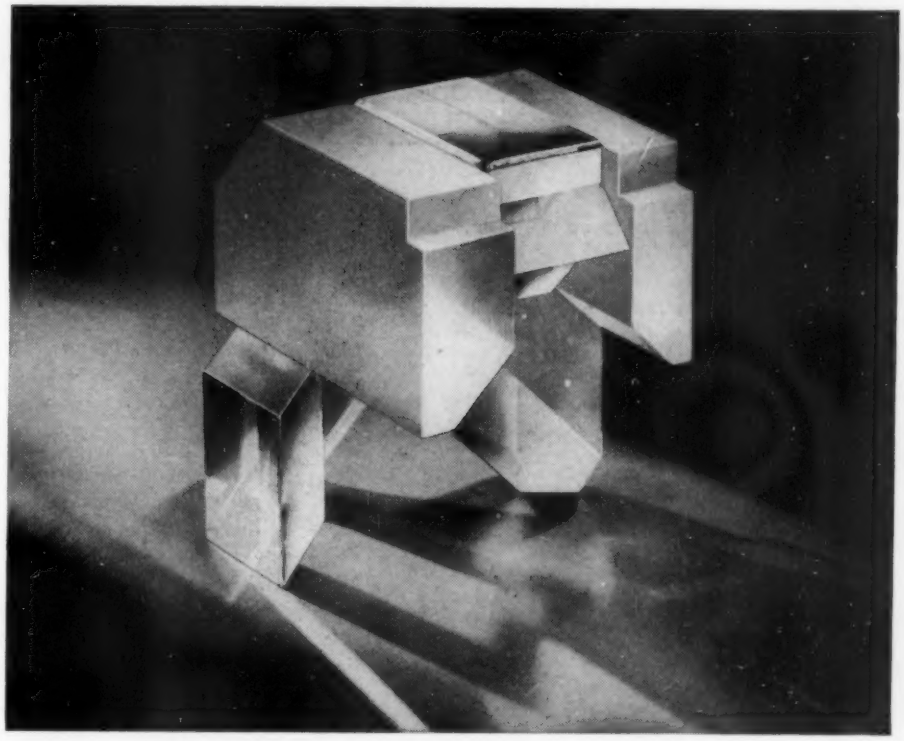
NEW "PICK-UP" CANE

Permits Disabled Persons To Pick Up Small Articles Without Painful Stooping.

NO OTHER CANE LIKE IT

The Mason "Pick-Up" is a light double purpose cane with concealed patented pick up mechanism that enables the user by simple finger pressure and without any stooping to easily pick up papers, pencils, cards, coins, etc. Proper balance and rubber grip tip insures safer walking. Use a beautifully finished Mason "Pick-Up" Cane yourself or as a perfect gift for a disabled service man or friend. Write today for FREE CIRCULAR and 5 days trial offer.

W. H. MASON
Box 27, Leesburgh, Ohio



To Win a Battle or Build a Better Mousetrap

Here is a range finder prism . . . the glass heart of one of the most precise optical instruments that the ingenuity of man has produced . . . so accurate that the angular error amounts to no more than 1 inch in 6½ miles. Created by Bausch & Lomb, every step in its manufacture has been controlled by the world's finest optical glass technicians. From the selection of the ingredients from which the optical glass is made to the final polishing, the objective has been to make America's gunfire the most accurate and deadly in the world.

This is the same care and these the same skills that are also producing the fine optical instruments used in the furtherance of our war effort. Tomorrow, many of those instruments will be available to help build better lawnmowers . . . razor blades . . . automobiles . . . vacuum cleaners, etc. . . . to hasten progress in scientific research, medicine, education.

BAUSCH & LOMB

OPTICAL CO., ROCHESTER, N. Y.

Est. 1853

Makers of Optical Glass and a Complete Line of Optical Instruments for Military Use, Education, Research Industry and Eyesight Correction and Conservation

•New Machines and Gadgets•

❁ *PICNIC TABLE, recently patented, when folded resembles the conventional suitcase that opens into equal halves. Its legs fold inside like those on a card table. One half of its body is equipped to hold plates, cups, knives and forks; the other half holds two folding chairs.*

Science News Letter, November 18, 1944

❁ *ROTARY slide rule permits rapid and accurate multiplication and division through the process of rotating a hand knob and operating a lever. The cursor, ordinarily the runner, is on a fixed window of a housing in which the scales revolve. An attached small microscope of good magnification assists reading.*

Science News Letter, November 18, 1944

❁ *BILLIARD-BALL collecting device, which is a controlling device as well, consists of ducts leading from the pockets to a central place through which the balls roll when released by a mechanism operated by a coin being put into a slot. It is for use in billiard parlors where money is paid for each play.*

Science News Letter, November 18, 1944

❁ *CRUTCH with a deep arm-pit cradle, adjustable hand-grip, and removable spike on the end for use when the ground is frozen or slippery, is now patented. When not in use the spike, which is the end of a rod extending through the leg of the crutch, is drawn up into the leg by a thumbscrew just under the hand-grip.*

Science News Letter, November 18, 1944

❁ *RUBBER PILLOWS, now used to jack up army aircraft on soft ground by filling them with air delivered by a gasoline-driven engine blower, raise the plane without injury to the wings when placed as illustrated in the picture. Each giant bag, when inflated, is six feet high and can support 12 tons.*

Science News Letter, November 18, 1944

❁ *FLUID SEPARATOR, for use on the gasoline supply line feeding an automobile engine, filters the gasoline through a porous metal membrane to free it from whatever water may have been mixed with it. The porous membrane, cup-shaped and placed inside a container into which the gasoline flows, permits the passage of gasoline only.*

Science News Letter, November 18, 1944

❁ *WEED MOWING machine of the walking type, good for cutting close to fences and walls, has a horizontally positioned rotatable disk extending from the front which carries three projecting short cutting blades. A small engine mounted on the axis of the two-wheeled machine causes the disk to rotate rapidly. It is pushed forward and guided with a pair of plow handles.*

Science News Letter, November 18, 1944

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Question Box

AERONAUTICS

In what way does the B29 resemble a jigsaw puzzle? p. 325

AERONAUTICS-PHOTOGRAPHY

How does a camera add to the safety of air travel? p. 325

CHEMISTRY

How has the life of shoe leather been increased? p. 328

EARTH SCIENCE

What great geyser recently erupted? p. 328

ENGINEERING

What may make it possible for newspapers to be printed in your own home? p. 324

MEDICINE

How are mice aiding cancer research? p. 328

How does lactose aid penicillin? p. 329

How does the new blood plasma flask work? p. 324

What two new ways of increasing the efficiency of penicillin have been tried? p. 329

OPTICS

What is the newest electronic "brain"? p. 326

ORNITHOLOGY

Where did the five new birds now in the Zoological Park in Washington come from? p. 328

PHYSICS-CHEMISTRY

For what work were the 1943 and 1944 Nobel prizes in physics awarded? p. 323

PSYCHOLOGY

On what two things does a soldier's morale depend? p. 327

ZOOLOGY

How many hybrid gibbons have been born? p. 329

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